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ABSTRACT

The effect of anxiety on learning in a variety of educational contexts is reviewed in general, and two areas of anxiety research especially relevant to educational psychology are reviewed in detail. The first is test anxiety reduction programs, and the second is the outcomes of these programs and the interaction between anxiety and instructional methods. Suggestions for further research in these areas include development of instructional techniques based on individual student differences and needs. (Author)

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Anxiety and Education[1]

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Anxiety is one of the critical psychological variables in education. There is a substantial body of research linking anxiety to the ability of students to profit from instruction. For example, Spielberger (1966) reported that more than 20% of students who were characterized as highly anxious dropped out of school because of academic failure while only 6% of a low anxious group left school for such reasons. Similar effects of anxiety on grade point average have been reported (Spielberger, 1962; Spielberger & Katzenmeyer, 1959). A recent review of the effects of anxiety on learning from instruction in a variety of settings (Sieber, O'Neil & Tobias, 1977) ranging from traditional classroom based environments to individualized instructional contexts such as programmed, computer managed and computer assisted instruction has similarly documented that anxiety interferes in students' achievement from a variety of instructional methods.

In the 1940's and 1950's anxiety was the focus of much research activity and practical concern in educational psychology. During that period one of the major educational issues dealt with concern for the "underachieving" child (Taylor, 1965) and anxiety was seen to have an important relationship to this epi-phenomenon. In the early 1960's Thorndike (1963) pointed out that the concept of underachievement was psychologically indefensible from both a measurement and statistical point of view. The waning of concern regarding underachievement, and the increased investment in research and development on compensatory education did much to reduce the interests of educational psychologists in anxiety. It was, therefore,

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not surprising that research and theoretical development dealing with anxiety as it relates to education were relatively scarce in the early 1960's. As noted elsewhere (Tobias, 1977a) indexes, and reviews of research in education during that period had either very few references or no references at all dealing with anxiety.

In the late 1960's and early 1970's there has been a slight resurgence of interest in the educational implications of anxiety research. One of the major factors in this concern has been a variety of attempts to treat anxiety symptomatically. Anxiety reduction programs, whether they were influenced by a behavioral or a more cognitive orientation, were increasingly implemented at a variety of educational institutions throughout the country (Allen, Elias & Zlotlow, in press; Denney, in press; Allen, 1972).

Much of the research on anxiety reduction programs is conducted in educational settings, yet very little of it or of the theoretical work pertinent to this movement appears in the literature customarily read by educational psychologists. This discrepancy is probably accounted for by the fact that anxiety reduction programs have their roots in psychotherapy, especially behaviorally oriented psychotherapy, which has been the traditional domain of clinical and counseling psychologists. One of the purposes of this paper is to draw the attention of educational psychologists to this area of intense activity, with a view towards stimulating interest in the possibility of collaborative research. Some specific suggestions for such research will be discussed below.

Another focus of anxiety research has been on the interaction between anxiety and instructional methods. This area has been one of the major components of a more general concern with establishing an interaction between differences in aptitudes and instructional methods (Cronbach & Snow,

1977; Tobias, 1976) commonly abbreviated as ATI. Research in this area has attempted to demonstrate an interaction between anxiety and instructional methods which were differentially affected by anxiety (Tobias, 1977a,b). Theoretically, such research has the promise of clarifying both the processes controlling instruction as well as the ways in which anxiety affects students' learning from instruction. Practically, this research offers the possibility of developing instructional adaptations which would maximize the learning of anxious youngsters.

Finally, research on the educational concommitants of anxiety has been a consistent, yet relatively minor theme in educational psychology both in the past and in the present. Such research typically reports relationships between anxiety scales and other instruments of interest to educational psychologists, or reports on the effects of anxiety on different types of instruction, or instruction in different areas. The persistent low level interest in this area has led to few integrative summaries regarding the implications of this work, or its theoretical import. For that reason and due to the constraints of time this field of anxiety research will receive little attention in the present presentation.

ANXIETY REDUCTION PROGRAMS

The seminal work in this area was Wolpe's (1958) Psychotherapy by Reciprocal Inhibition. In this widely known source Wolpe recommended the use of systematic desensitization as a counterconditioning procedure for individuals suffering from a wide range of emotional problems associated with anxiety. Briefly, desensitization therapy induces a deep-muscle relaxation procedure, originally attributed to Jacobson (1938), and then instructs the affected individual to visualize the anxiety arousing situation in a relaxed state in an ordered series of increasingly stressful

scenes, called an anxiety hierarchy. The client is then gradually brought into closer contact with the most feared situation or stimulus. Following successful treatment, the client is able to approach the hitherto fear arousing situation without the negative affect previously associated with it. Wolpe assumed that relaxation and anxiety constituted antagonistic responses so that strengthening relaxation responses to a stimulus which previously evoked anxiety and other aversive responses would result in the gradual weakening and eventual elimination of the anxiety responses to the stimulus. Subsequent work in this area (Goldfried, 1971; Wilkins, 1971) has suggested that the processes accounting for the success of systematic desensitization may well be more complex than originally envisioned.

Of greatest interest to educational psychologists is one part of the vast anxiety reduction literature: the reduction of test anxiety. Test anxiety, in general, can be defined as anxiety aroused in evaluative situations, especially by the variety of tests administered in most educational institutions. Test anxiety is typically assessed with the Test Anxiety Questionnaire (Mandler and Sarason, 1952) a Likert type scale, or the Test Anxiety Scale (I. Sarason, 1972) which consists of a 37 item true and false scale whose correlations with the Likert scale are typically in the .90 range and above. For children test anxiety is usually assessed by the Test Anxiety Scale for Children (Sarason, Davidson, Lighthall, Waite, and Ruebush, 1960). Test anxiety has been found to interfere most in student's achievement in educational settings of one kind or another and is the focus of the anxiety reduction programs conducted in education institutions, as well as forming a vigorous sub-specialty in the practice and research on anxiety reduction. Wolpe's progressive systematic desensitization is generally considered (Denney, in press) the most widely used procedure for the treatment of test anxiety.

Other Approaches to Test Anxiety Reduction

There have been a large number of new developments and variation since Wolpe's systematic desensitization. Denney(in press) characterizes these new developments as consisting of three categories and the following report is based on Denney's discussion: 1) Applied relaxation techniques, 2) self-control training techniques, and 3) cognitive coping techniques. These labels refer to a continuum of self-control procedures. The succeeding discussion is based on Denney's description of these categories.

Applied Relaxation Techniques. In these procedures students are generally told that the purpose of the treatment is to provide them with effective means for coping with anxiety by relaxation training so that they can, in the future, bring the relaxation response under voluntary control. Students then receive training in the induction of relaxation and finally, in the application of relaxation techniques in stressful settings outside of treatment.

Self-control Training Techniques. In this category treatment consists of a variety of procedures in addition to those described above under applied relaxation training. A prominent feature of these procedures is the inclusion of guided rehearsal during which students are encouraged to confront a stressful stimulus within the training program. As this stimulus evokes tension, students are instructed to use the coping skills they had previously learned to reduce tension and anxiety.

Cognitive Coping Techniques. These techniques add a variety of features to those described under self-control procedures. In addition, students are taught that the beliefs they hold in most situations affect emotional reactions, especially the beliefs about themselves as expressed in negative self-statements that occur to them in stressful situations.

The students are then assisted in developing more positive self-statements to help reduce anxiety in stressful situations. Denney suggests that the procedures advocated by Meichenbaum (1972), Holyroyd (1976) and by Wine (1971) fit into this category.

Modeling and Automated Approaches to Test Anxiety Reduction. In addition to the techniques described above there are a number of other approaches prominently utilized in anxiety reduction programs. Rosenthal (in press) describes a series of techniques appropriate for anxiety reduction which are based on modeling approaches drawing their impetus from the work of Bandura (1977). This category includes procedures such as vicarious desensitization in which students either individually or in a group watch the desensitization of a peer model. Another variation on this technique is to have students watch the desensitization of a model on film or video tape. These procedures have been found to be equivalent to direct desensitization (Mann and Rosenthal, 1969; Mann, 1972). Other techniques in the same general area include observing models role-playing calm test taking techniques, self-modeling in which students watch edited versions of their own responses, and using scripts with encouragement to students to imagine people and acting out appropriate scenes. These techniques, in individual and group contexts, have been found to be effective in a wide variety of anxiety reduction programs (Rosenthal, in press).

There also are reports of automated anxiety reduction programs (Richardson, O'Neil and Grant, 1977). The program can be completed by the student with little contact with counselors or therapists. The student is provided with a manual describing techniques of coping with test anxiety and observes a video tape which consists of a therapist briefly describing how panicky self-talk and inattention interfere with test performance. A

model takes a computer administered intelligence test while making negative self-references and manifesting difficulty in attending to the task. Finally, the model repeats the sequence of answering questions on terminal, but now manifests appropriate behaviour, more positive self-talk, and copes with anxiety by self-induced relaxation techniques. Students were also instructed in a modified desensitization procedure following Meichenbaum's (1972) approach including a half-hour's training in deep muscle relaxation administered via video tape. Finally, students practiced responding to test questions at a computer terminal. The students were reminded to engage in relaxing and coping behaviors and encouraged to practice these techniques while answering test questions.

Outcomes of Anxiety Reduction Programs

In a review of 49 studies describing anxiety reduction programs, Allen et al (in press) found that in 58% of the investigations the treated groups showed greater improvement than non-treated groups on self-report measures of anxiety. In no instance did non-treated students report greater improvement on self-report measures than the treated students. In terms of improvement on cognitive performance indices such as tests, grades and the like, only 18% of the treated groups improved on performance criteria, compared to the non-treated groups; in an additional 29% of the studies some, but not all, of the treated groups showed performance improvements compared to non-treated students. In 50% of the studies the treated and untreated groups were approximately equal on performance outcomes and in 3% of the studies the non-treated groups outperformed the treated groups.

Comparisons of anxiety reduction treatments based on progressive desensitization to no treatment were also reported by Allen et al (in press). In 77% of the reports, students who underwent progressive desensitization

improved to a greater extent than non-treated controls on self-report measures of anxiety and tension. However, in only 11% of the studies was the performance of treated groups superior on cognitive indices. While non-treated groups did not exceed the groups exposed to progressive desensitization on any of the self-report measures, 11% of the non-treated groups had superior cognitive performance to the treated groups. Finally, in 29% of the reports, treated groups had more positive self-reports than groups receiving a placebo treatment. Placebo treatment subjects were usually given some kind of irrelevant instruction. In 25% of the cases, the treated groups outperformed the placebo groups on cognitive indices. There were no reports of the placebo group outperforming the treated group either in self-report or in performance indices.

Denney (in press) reviewed the results of 20 anxiety reduction studies. In all but two of these there was evidence of a significant reduction in anxiety as determined by self-report measures. Furthermore, 54% of the 15 studies that employed performance outcome measures reported significant improvement for treated compared to untreated controls. These data are relatively similar to those reported by Allen et al. Denney had categorized these studies in terms of the categories described above and reports the following results in each category: For applied relaxation techniques, one out of three studies had evidence of performance improvement. Those studies in the category of self-control training techniques had evidence of performance improvement in 50% of the studies (4 of 8). Finally, 71% of the studies (5 of 7) in the category of cognitive coping techniques had evidence of improvement on performance measures. The increasing incidence of improvement in performance outcomes in the various categories will be discussed later.

Finally, the outcomes of the automated anxiety reduction program

described previously (Richardson, O'Neil and Grant, 1977) was similar to the other studies reported above, that is, subjects improved on a number of self-report measures of anxiety, however, there was no evidence of significant improvement on cognitive performance measures.

ANXIETY AND INSTRUCTIONAL METHODS

The interaction between anxiety and instructional methods is typically studied by assigning students to alternate instructional stretegies assumed to be differentially affected by anxiety and then studying the interaction between instructional method and anxiety as measured by one, or a number of different subscales. Extensive reviews of the details of this research and problems in the statistical analyses of some of these data are available elsewhere (Cronbach and Snow, 1977; Tobias, 1977b,c). The purpose of this section of the present paper is to highlight some of the major issues of this research, summarize a model intended to advance research in this area, and advance some hypotheses concerning learning from instruction by anxious youngsters.

One of the key problems in research on the interaction between anxiety and instructional methods has been the assumption that different instructional methods would be differentially affected by anxiety. Little is known about the processes that are engaged by instructional methods; equally little is known about the processes by which anxiety affects learning. Investigators in this area then attempted to identify a phenomenon without a clear cut understanding of the conditions, that is, the instructional methods under which the phenomenon would reveal itself, nor the variables accounting for the phenomenon, i.e., the processes by which anxiety affects learning. It is not surprising, then, that there had been little consistency in the research findings on the interaction between anxiety and

instructional methods (Tobias, 1977b; Tobias, in press; Cronbach and Snow, 1977, Chapter 10). Interactions, in those studies where they did emerge, have proven to be anything but robust and difficult to replicate in going from one study to another. After a detailed review of some of the research in this area (Tobias, 1977b) a research model has been proposed that summarizes some of the prior research in this area, and suggests a number of general hypotheses regarding promising direction further research may take (Tobias, 1977c).

Research Model

Anxiety is an affective state. Since learning is a process which is essentially cognitively mediated anxiety can affect learning only indirectly by impacting on the cognitive processes mediating learning at various stages. This process is outlined in Figure 1.

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Insert Figure 1 about here

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The model in Figure 1 arbitrarily divides the instructional process into the three classical information processing components: input, processing, and output. The input section describes the presentation of instructional material to students. The processing section encompasses all operations performed by students to register, record, organize, store and retrieve instructional input. Output denotes the students' performance on any measure demonstrating that instructional objectives have been mastered. The indirect ways by which anxiety can affect instruction are indicated in the model by broken lines. It is hypothesized that there are three possible points where anxiety can have the largest effect on learning from instruction: 1) pre-processing, 2) during processing, and 3) right after pro-

cessing and just before output.

Pre-processing. At this stage anxiety can impact on learning by interfering in the degree to which external stimulation, i.e., input, has been internally represented or registered. It has been suggested (Sarason, 1972; Wine, 1971) that anxious students divide their attention between the demands of the task and preoccupations with somatic concerns and negative self-references. Less anxious students generally out-perform their more anxious counterparts since they devote more of their attention to task demands and less concern over task irrelevant preoccupations. The model suggests that this diversion of attention interferes in making nominal input effective stimuli for anxious learners. Preprocessing interference is most debilitating to students since the greater the restriction of input the smaller the proportion of the instructional content available for processing. This type of interference is likely to be cumulative since input which has not been internally represented can, of course, not be effectively processed.

It is suggested that any procedures which permit students to reinstitute some segment of input would reduce the potential interference of anxiety at this stage. Such operations as being able to rewind an audio or videotape, being able to branch back to prior segments of instruction and comparable operations should reduce this source of interference and ought to be especially beneficial to the performance of high anxiety students. It is expected, furthermore, that the performance of low anxiety students is likely to be unaffected by these operations. An ordinal interaction is the expected between procedures for reinstituting instructional input and anxiety in which the performance of high anxious students is facilitated by such procedures, whereas the performance for low anxiety individuals is relatively unaffected by them.

Processing effect. At this stage anxiety impacts on instruction directly by affecting the cognitive operations performed to process input. At this point three types of manipulations are likely to have the clearest effect on learning:

1) Difficulty. Research has shown repeatedly that the performance of anxious individuals is poorer than that of their low anxiety counterparts on difficult content than it is on easy material. Any reduction in difficulty should, then, be differentially effective for anxious students.

2) Reliance on memory. Instructional methods in which students are required to rely on short and intermediate term memory are subject to greater interference for anxious students than content retrieved from long-term memory. Evidence supporting this reasoning was reported by Kreitzberg (Note 1). It is reasoned then, that any procedure which reduces the degree to which students have to rely on memory such as by making prior instructional content available to students, will improve the achievement of students high in anxiety.

3) Organization of the task. A number of studies have indicated that material which is well-organized results in superior achievement for anxious students compared to less anxious individuals. Any organization which assures better organization of input is, therefore, expected to be differentially effective for anxious students.

Post-processing effect. This category is meant to represent interference in retrieving content mastered during instruction at some subsequent point such as on a post-test. When formative tests administered during instruction indicate that mastery has been attained, yet students are unable to pass the summative test on the same content at a later point in time, this type of interference is suggested. There were no studies of this effect though the model suggests that this type of interference should be found given the appropriate experimental manipulations. This type of interference is reported by students who claim to have studied diligently yet "freeze up" on tests.

Research Findings

The research model described above clarifies some of the reasons for the inconsistencies in research findings on the interaction between instructional methods and anxiety. In some of those studies (reviewed in detail elsewhere: Tobias, 1977b; Tobias, in press; Cronbach and Snow, 1977, Ch. 10) the instructional methods consisted of different versions of a programmed instructional text, or a computer assisted or computer managed instructional program. In some investigations, the mode with which the students responded to the instructional content were varied, others manipulated program length, type of feedback, or comparable procedures. The model suggests that these manipulations may not have been differentially affected by anxiety since in many of these studies the degree to which students could reinstitute prior input, the difficulty of the material, and the reliance on memory were not varied in the different instructional methods. From the point of view of the model, then, differences in achievement could not have been expected.

In studies varying parameters specified by the model, results were generally consistent with expectations. For example, Oosthoek and Ackers (1973) found that the performance of anxious students who could rewind an audio tape was facilitated compared to those without a rewind capacity; furthermore, anxious students tended to use the rewind option more frequently than those lower in anxiety. Mayer (Note 2) studied the effects of student or experimenter pacing. Self-paced students could switch from one problem to the other at any time, with the restriction that no more than ten minutes could be spent on any one problem. In the experimenter paced group, the order of presentation was determined in advance. An anxiety by pacing interaction indicated that self-pacing improved the performance of high anxious subjects but had little effect on individuals low in anxiety. This effect was replicated in a subsequent experiment. These findings are generally consistent

with the model since self-paced subjects were freer to reinstitute any part of the input temporarily not attended to.

Moore (Note 2) compared differences between open and traditional third and fourth grade classes in both general and test anxiety and on a number of other variables. It was found that third and fourth graders attending open classes expressed more general anxiety than did students attending traditional classes. These results are also in general accord with the model since traditional classes can be expected to be more tightly organized in terms of the sequence with which different types of content is taught.

A detailed review of studies pertaining to the model is beyond the scope of this presentation, but is available elsewhere (Tobias, in press).

In summary, in those studies where the variables investigated, and the manipulation of instructional characteristics were consistent with the predictions made in the model, results were generally supportive of expectations. It is hoped that continuing research on these predictions will clarify the interaction between anxiety and instructional content.

CONCLUSION

This paper has attempted to review two major areas of anxiety research which are highly relevant to education: The treatment of anxious individuals in test anxiety reduction programs and the adaptation of instructional materials so that interference by anxiety can be minimized. While these two areas appear to be relatively distinct and separate from one another there would appear to be a greater potential for mutual cross-fertilization than would at first appear.

To begin with, only a small percentage of the individuals requiring assistance for the management of their anxiety are likely to be referred for, or voluntarily avail themselves of the potential benefit of anxiety

reduction programs. At the practical level, then, there will always be need for instructional materials with adaptive features which are expecially resistant to the debilitating effects of anxiety. In this sense, then, attempts to reduce anxiety directly and attempts to design instructional material to compensate for the effects of anxiety can be viewed as mutually compatible treatment approaches to reduce the debilitating effects of anxiety on instructional outcomes.

The test anxiety reduction programs reviewed above can be described as relying essentially on an instructional strategy. Unlike the traditional psychotherapeutic approaches which were based on psychoanalytic or phenomenological theories anxiety reduction programs are easily conceptualized in contemporary instructional models. Formal pretests in the form of self-descriptive anxiety scales are administered. In addition prior data are often available regarding the students' performance on cognitive pretests or in the form of grades obtained on achievement measures taken in classes for which the student is registered. A specific, frequently behavioral, objective is then formulated and a set of experiences designed to accomplish that objective is devised. These experiences are frequently q ite overtly didactic and not unlike teaching other cognitive personal management skills. Finally, posttests, similar to the pretests described above, are then administered to determine whether the objectives have been attained.

What is being suggested here is that the experience accumulated by educational psychologists in many instructional design efforts are directly applicable to test anxiety reduction programs. The hardwon experience of educational psychologists in conducting task analyses, establishing hierarchies

and breaking down objectives into smaller units should have ready applicability to the problems encountered in various test anxiety reduction efforts. Clearly, collaborative research and development efforts between educational and clinical and counseling psychologists active in this area would be mutually rewarding.

One caveat is in order here. I am not urging or recommending that educational psychologists rush out to practice test anxiety reduction. Much harm to an unsophisticated public can result from such efforts, whatever their motivation. If educational psychologist want to become involved in the practice of anxiety reduction they ought to avail themselves of the training and internship experiences required for such activity. To indicate that these are essentially instructional activities does not suggest that they are easy, harmless, or that expertise in conducting them is had by any educational psychologist. It is suggested, however, that collaborative research, development and theoretical efforts, as well as joint evaluation of the outcomes of such programs between practitioners and educational psychologists has much to offer both groups.

A further area of compatability between educational psychology and the work in anxiety reduction programs emerges from an analysis of the outcomes of anxiety reduction programs. The review of that research has suggested that a very large percentage of these programs succeed in reducing students' anxiety as determined by a variety of self-report measures. A decidedly smaller percentage of outcome studies has found that the symptomatic reductions were accompanied by improvement in scholastic or cognitive performance indices. Failure to improve cognitive performance may, of course, be attributable to problems in the treatment programs or their administration. The absence of performance improvement in some of these studies may be seen as a failure

of training to transfer to situations outside of treatment. The literature in educational psychology has suggested for some time that transfer of training rarely occurs unless specific provisions for it are made in the instructional sequence. Denney's (in press) categories of anxiety reduction programs can be conceptualized as gradual increments in the degree to which specific training in transfer to situations outside of the treatment context were built into the programs. The results of outcome studies then suggested that the more specifically such training was part of the program the more likely were the results of treatment to transfer to the cognitive performance of students in real life situations. One would expect that instructional psychologists would have much relevant experience to offer regarding the design of instruction to maximize transfer.

Another explanation for the variability in performance outcomes of anxiety reduction programs is that all treatment approaches may not be equally beneficial to all individuals. Students with a history of academic accomplishment, strong study skills, and reasonably effective coping strategies who are experiencing anxiety reactions may well achieve significant relief by systematic desensitization alone. On the other hand, students who have a history of difficulties in prior academic performance, or lack sound study or coping skills are quite likly to respond to a demanding academic environment with intense anxiety. Anxiety reduction may well make such individuals feel somewhat more comfortable, yet leave the academic and cognitive performance entirely unaffected. This rationale, then, suggests that research on the symptomatic treatment of anxiety may profit enormously from an ATI approach. Specifically, can interactions be established between different forms of anxiety reduction training and differences in the problems with which students are referred to anxiety reduction treatment programs?

What is suggested is that a potentially fruitful interaction exists between ATI research on the one hand and research on anxiety reduction. A fundamental tennet of ATI research, in anxiety and other areas, is that there is no one maximally effective instructional strategy for all individuals. It seems equally likely that there is no one maximally effective anxiety reduction program for all types of students. Perhaps research designed to match the type of complaint to the type of treatment may yield interactions with more positive outcomes with respect to improving students' academic performance than having these two areas of research run side by side without any contact. In ATI research we have attempted to adapt instructional techniques to individual differences among students. The present analysis suggests than an equally fruitful field of research may be to attempt to match student problems with respect to anxiety with the type of anxiety reduction treatment ideally suited to that particular student.

Footnotes

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2. Preparation of this manuscript was partially supported by the Institute for Research and Development in Occupational Education, Center for Advanced Study in Education, City University of New York.

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